

CLAIMS

WHAT IS CLAIMED IS:

1. An inline filter assembly comprising:
 - an elongate flexible inlet connecting tube having a proximal end and a distal end and a side wall defining a longitudinal flow passage therebetween;
 - an elongate flexible outlet connecting tube having a proximal end and a distal end and a side wall defining a longitudinal flow passage therebetween;
 - an intermediate filter body including an elongate hollow tube having a side wall defining a flow passage along a longitudinal axis with an inlet and an outlet at respective upstream and downstream ends spaced along said longitudinal axis;
 - a first fitting for connecting said inlet tube proximal end to said filter body at its upstream end, said first fitting having a relatively small diameter upstream distal end portion and a relatively large diameter downstream proximal end portion, said filter body inlet being positioned over said first fitting proximal end portion and having an internal diameter generally corresponding thereto, said inlet tube proximal end being positioned over said first fitting distal portion and having an internal diameter generally corresponding thereto, said first fitting defining a passageway therethrough extending between its distal and proximal portions to provide fluid communication between said inlet tube and said filter body;

a second fitting for connecting said outlet tube
28 proximal end to said filter body at its downstream end,
said second fitting having a relatively large diameter
30 upstream proximal end portion and a relatively small
diameter downstream distal end portion, said filter body
32 outlet being positioned over said second fitting proximal
end portion and having an internal diameter generally
34 corresponding thereto, said outlet tube proximal end being
positioned over said second fitting distal portion and
36 having an internal diameter generally corresponding
thereto, said second fitting defining a passageway
38 therethrough extending between its proximal and distal
portions to provide fluid communication between said filter
40 body and said outlet tube; and,

filter media disposed within said filter body for
42 removing impurities from fluid flowing therethrough.

2. The inline filter of claim 1 wherein the
2 internal diameter of the passageway of at least one of said
fittings is relatively larger near its proximal end than at
4 its distal end.

3. The inline filter of claim 2 further
2 including second filter media disposed in one of said
fittings within its passageway larger diameter portion for
4 removing impurities from fluid flowing therethrough.

4. The inline filter of claim 1 further
2 including second filter media disposed in the passageway of
one of said fittings.

5. The inline filter of claim 4 wherein one of
2 said filters physically removes solid impurities from fluid
flowing therethrough.

6. The inline filter of claim 4 wherein one of
2 said filters chemically purifies fluid flowing
therethrough.

7. The inline filter of claim 4 wherein said
2 first filter media is pervious to fluid flow and impervious
to impurities larger than a first determined size to
4 prevent larger impurities from moving from said inlet tube
downstream to said outlet tube, and said second filter
6 media is positioned downstream of said first filter media
and is impervious to impurities larger than a second
8 determined size smaller than said first predetermined size
to prevent smaller impurities from moving from said inlet
10 tube downstream to said outlet tube.

2 8. The inline filter of claim 4 wherein said
first filter media is an array of filtering particles.

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9. The inline filter of claim 8 further
6 including a fluid pervious barrier filter positioned
between said array of filtering particles and one of said
8 fittings for maintaining said filtering particles within
said filter body.

10. The inline filter of claim 4 wherein said
2 second filter media is sintered bronze.

11. The inline filter of claim 4 wherein one of
2 said filter media is a longitudinal series of at least two
filter elements for removing impurities from fluid flowing
4 therethrough, each filter element having a differing
porosity with a downstream filter element being impervious
6 to smaller impurities than an upstream filter element.

12. The inline filter of claim 11 wherein said
2 series of filters is a longitudinal series of particulate
layers, each layer having particulate of a size relatively
4 different from the particulate of an adjacent layer whereby
each layer is impervious to different sized impurities.

13. The inline filter of claim 11 wherein said
2 series of filters is a longitudinal series of screens, each
screen having a different size mesh whereby each screen is
4 impervious to different sized impurities.

14. The inline filter of claim 1 further
2 including second filter media disposed between said first
fitting and said first filter media for removing impurities
4 from fluid flowing therethrough.

15. An inline filter assembly comprising:

2 an elongate flexible inlet connecting tube having
a proximal end and a distal end and a side wall defining a
4 longitudinal flow passage therebetween;

an elongate flexible outlet connecting tube
6 having a proximal end and a distal end and a side wall
defining a longitudinal flow passage therebetween;

8 an intermediate filter body including an elongate
hollow tube having a side wall defining a flow passage
10 along a longitudinal axis with an inlet and an outlet at
respective upstream and downstream ends spaced along said
12 longitudinal axis;

a first fitting for connecting said inlet tube
14 proximal end to said filter body at its upstream end, said
first fitting having a relatively small diameter upstream
16 distal end portion and a relatively large diameter
downstream proximal end portion, said filter body inlet
18 being positioned over said first fitting proximal end
portion and having an internal diameter generally
20 corresponding thereto, said inlet tube proximal end being
positioned over said first fitting distal portion and
22 having an internal diameter generally corresponding
thereto, said first fitting defining a passageway
24 therethrough extending between its distal and proximal
portions to provide fluid communication between said inlet
26 tube and said filter body with the internal diameter of
said passageway being relatively larger near its proximal
28 end than at its distal end;

a second fitting for connecting said outlet tube
30 proximal end to said filter body at its downstream end,

said second fitting having a relatively large diameter
32 upstream proximal end portion and a relatively small
diameter downstream distal end portion, said filter body
34 outlet being positioned over said second fitting proximal
end portion and having an internal diameter generally
36 corresponding thereto, said outlet tube proximal end being
positioned over said second fitting distal portion and
38 having an internal diameter generally corresponding
thereto, said second fitting defining a passageway
40 therethrough extending between its proximal and distal
portions to provide fluid communication between said filter
42 body and said outlet tube with the internal diameter of
said passageway being relatively larger near its proximal
44 end than at its distal end; and,
filter media disposed within said filter body for
46 removing impurities from fluid flowing therethrough.

16. The inline filter of claim 15 further
2 including an external rib extending radially outward from
each of said fitting distal end portions for limiting
4 relative longitudinal movement of said connecting tubes
over the external surface of said fittings, each of said
6 external ribs having a camming surface facing the distal
end of said fittings, and said connecting tubes being
8 sufficiently resilient to facilitate longitudinal
positioning of said connecting tubes onto the fitting
10 distal end portions over said ribs.

17. The inline filter of claim 16 further
2 including a pair of tube clamps, one of said clamps being
circumferentially positioned over each of said connecting
4 tubes near its respective proximal end to hold said
connecting tubes on the distal end portions of said
6 fittings.

18. The inline filter of claim 15 further
2 including an external rib extending radially outward from
each of said fitting proximal end portions for limiting
4 relative longitudinal movement of said filter body over the
external surface of said fittings.

19. The inline filter of claim 18 wherein each
2 of said external ribs has a camming surface facing the
proximal end of said fittings, said filter body being
4 flexible and sufficiently resilient to facilitate
longitudinal positioning of said filter body onto the
6 fitting proximal end portions over said ribs.

20. The inline filter of claim 19 further
2 including a pair of tube clamps, one of said clamps being
circumferentially positioned over said filter body near
4 each end thereof to hold said filter body on the proximal
end portions of said fittings.

21. An inline filter assembly comprising:

2 an elongate flexible inlet connecting tube having
a proximal end and a distal end and a side wall defining a
4 longitudinal flow passage therebetween;

 an elongate flexible outlet connecting tube
6 having a proximal end and a distal end and a side wall
defining a longitudinal flow passage therebetween;

8 an intermediate filter body including an elongate
flexible hollow tube having a side wall defining a flow
10 passage along a longitudinal axis with an inlet and an
outlet at respective upstream and downstream ends spaced
12 along said longitudinal axis;

 a first fitting for connecting said inlet tube
14 proximal end to said filter body at its upstream end, said
first fitting having a relatively small diameter upstream
16 distal end portion and a relatively large diameter
downstream proximal end portion, said filter body inlet
18 being positioned over said first fitting proximal end
portion and having an internal diameter generally
20 corresponding thereto, said inlet tube proximal end being
positioned over said first fitting distal portion and
22 having an internal diameter generally corresponding
thereto, said first fitting defining a passageway
24 therethrough extending between its distal and proximal
portions to provide fluid communication between said outlet
26 tube and said filter body with the internal diameter of
said passageway being relatively larger near its proximal
28 end than at its distal end;

 a second fitting for connecting said outlet tube
30 proximal end to said filter body at its downstream end,

32 said second fitting having a relatively large diameter
upstream proximal end portion and a relatively small
diameter downstream distal end portion, said filter body
34 outlet being positioned over said second fitting proximal
end portion and having an internal diameter generally
36 corresponding thereto, said outlet tube proximal end being
positioned over said second fitting distal portion and
38 having an internal diameter generally corresponding
thereto, said second fitting defining a passageway
40 therethrough extending between its proximal and distal
portions to provide fluid communication between said filter
42 body and said outlet tube with the internal diameter of
said passageway being relatively larger near its proximal
44 end than at its distal end;

an external rib extending radially outward from
46 each of said fitting proximal end portions for limiting
relative longitudinal movement of said filter body over the
48 external surface of said fittings, each of said external
ribs having a camming surface facing the proximal end of
50 said fittings, said filter body being sufficiently
resilient to facilitate longitudinal positioning of said
52 filter body onto the fitting proximal end portions over the
proximal end ribs;

54 a first pair of tube clamps, one clamp being
circumferentially positioned over said filter body near
56 each end thereof to hold said filter body on the distal end
portions of said fittings;

58 an external rib extending radially outward from
each of said fitting distal end portions for limiting
60 relative longitudinal movement of said connecting tubes

over the external surface of said fittings, each of said
62 external ribs having a camming surface facing the distal
end of said fittings, said connecting tubes being
64 sufficiently resilient to facilitate longitudinal
positioning of said connecting tubes onto said fitting
66 distal end portions over the distal end ribs;

a second pair of tube clamps, one of said second
68 clamps being circumferentially positioned over each of said
connecting tubes near its respective proximal end to hold
70 said connecting tubes on the distal end portions of said
fittings; and,

72 filter media disposed within said filter body for
removing impurities from fluid flowing therethrough.

22. The inline filter of claim 21 further
2 including second filter media disposed in one of said
fittings within its passageway larger diameter portion for
4 removing impurities from fluid flowing therethrough.